PB-239 553

LAKE EAU CLAIRE, EAU CLAIRE COUNTY, WISCONSIN

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center
Wisconsin National Guard
Wisconsin Department of Natural Resources

October 1974

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT
ON
LAKE EAU CLAIRE
EAU CLAIRE COUNTY
WISCONSIN
EPA REGION V
WORKING PAPER No. 37

WITH THE COOPERATION OF THE
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
AND THE
WISCONSIN NATIONAL GUARD

OCTOBER, 1974

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Wisconsin Department of Natural Resources for professional involvement and to the Wisconsin National Guard for conduct of the tributary sampling phase of the Survey.

Francis H. Schraufnagel, Acting Assistant Director, and Joseph R. Ball of the Bureau of Water Quality, and Donald R. Winter, Lake Rehabilitation Program, provided invaluable lake documentation and counsel during the Survey. Central Office and District Office personnel of the Department of Natural Resources reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper series.

Major General James J. Lison, Jr., the Adjutant General of Wisconsin, and Project Officer CW-4 Donald D. Erickson, who directed the volunteer efforts of the Wisconsin National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

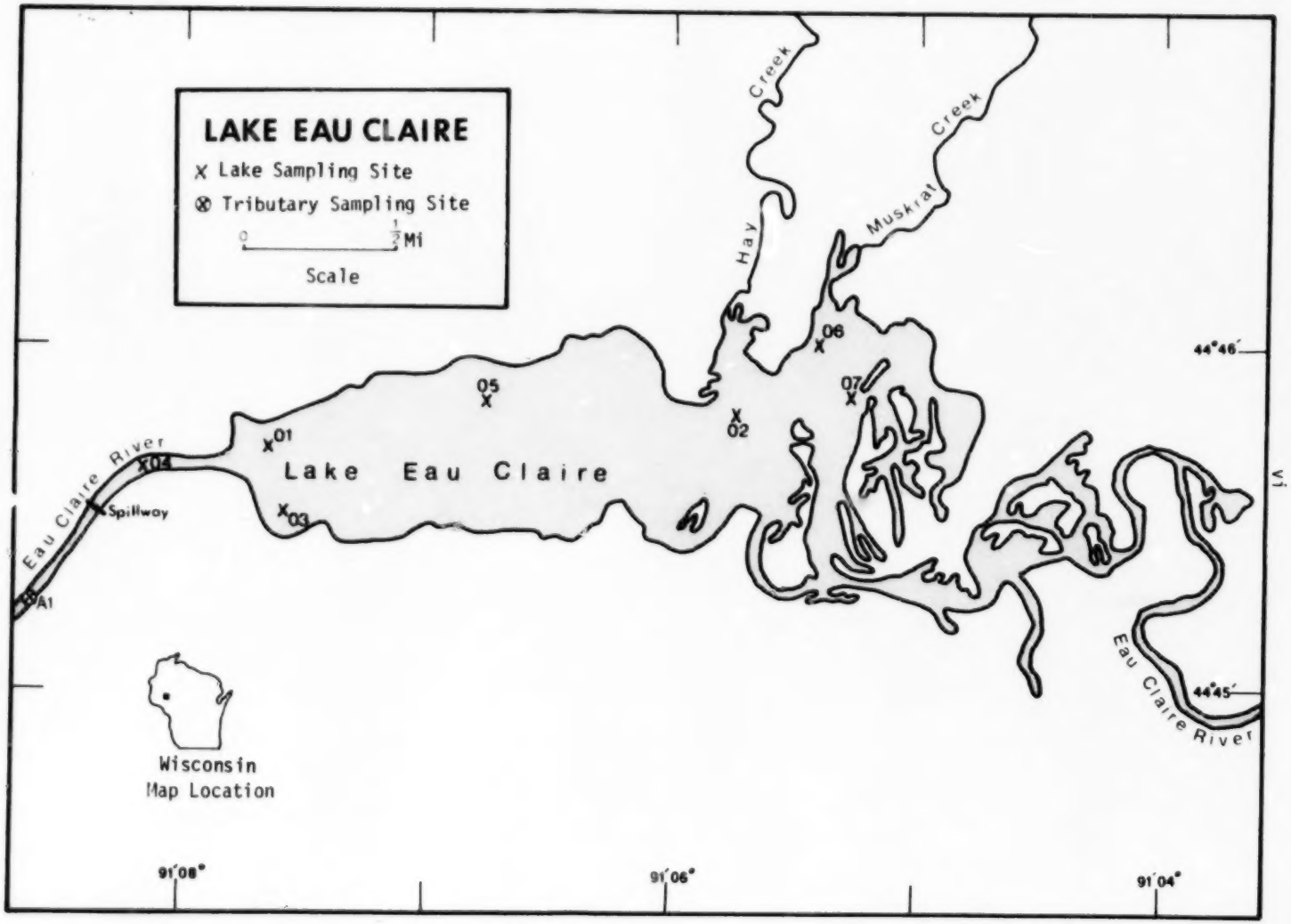
NATIONAL EUTROPHICATION SURVEY

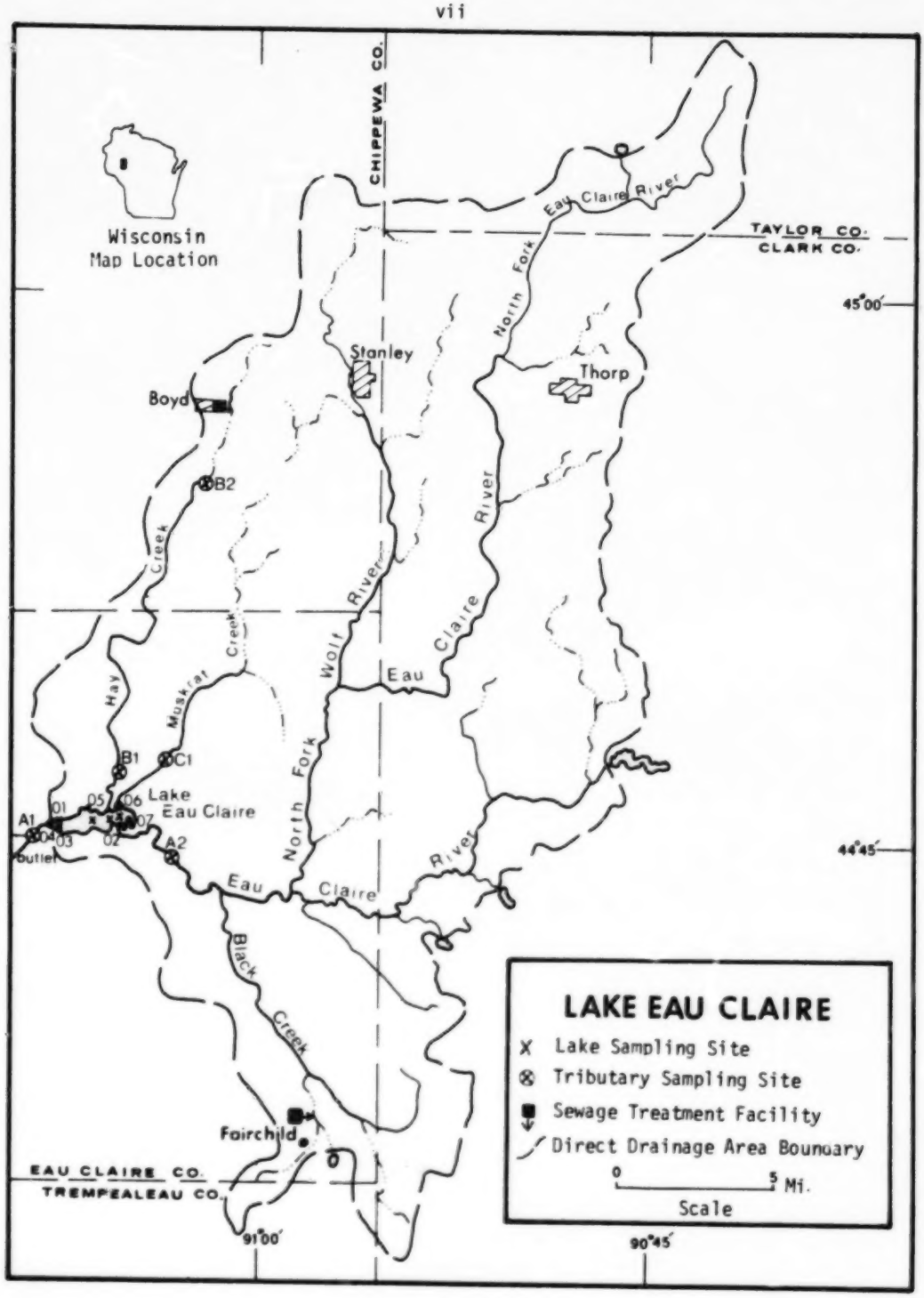
STUDY LAKES

STATE OF WISCONSIN

LAKE NAME	COUNTY
Altoona	Eau Claire
Beaver Dam	Barron
Beaver Dam	Dodge
Big Eau Pleine	Marathon
Browns	Racine
Butte des Morts	Winnebago
Butternut	Price, Ashland
Castle Rock Flowage	Juneau
Como	Walworth
Crystal	Vilas
Delavan	Walworth
Eau Claire	Eau Claire
Elk	Price
Geneva	Walworth
Grand	Green Lake
Green	Green Lake
Kegonsa	Dane
Koshkonong	Jefferson, Rock, Dane
Lac La Belle	Waukesha
Long	Price
Middle	Walworth
Nagawicka	Waukesha
Oconomowoc	Waukesha
Okauchee	Waukesha
Petenwell Flowage	Juneau
Pewaukee	Waukesha
Pigeon	Waupaca
Pine	Waukesha
Poygan	Winnebago, Waushara
Rock	Jefferson
Rome Pond	Jefferson, Waukesha
Round	Waupaca
Shawano	Shawano

LAKE NAME	COUNTY
Sinnissippi	Dodge
Swan	Columbia
Tainter	Dunn
Tichigan	Racine
Townline	Oneida
Trout	Vilas
Wapogassett	Polk
Wausau	Marathon
Willow	Oneida
Winnebago	Winnebago, Fond Du Lac, Calumet
Wisconsin	Columbia
Wissota	Chippewa
Yellow	Burnett


LAKE EAU CLAIRE
X Lake Sampling Site
⊗ Tributary Sampling Site
0 1/2 Mi
Scale
Hay Creek
Muskrat Creek
Lake Eau Claire
Eau Claire River
Spillway
01
02
03
04
05
06
07
A1
Wisconsin
Map Location
44°46'
44°45'
91°08'
91°06'
91°04'


Wisconsin
Map Location
CHIPPEWA CO.
TAYLOR CO.
CLARK CO.
EAU CLAIRE CO.
TREMPEALEAU CO.
45°00'
44°45'
91°00'
90°45'
Stanley
Thorp
Boyd
Fairchild
Eau Claire River
North Fork
Wolt
Hay
Creek
Muskrat
Creek
Black
Creek
Lake
Eau Claire
Outlet
A1
A2
B1
B2
C1
01
02
03
04
05
06
07
LAKE EAU CLAIRE
Lake Sampling Site
Tributary Sampling Site
Sewage Treatment Facility
Direct Drainage Area Bounoary
0
5 Mi.
Scale

LAKE EAU CLAIRE

STORET NO. 5515

I. CONCLUSIONS

A. Trophic Condition:

Survey data and the records of others show that Lake Eau Claire is eutrophic.

B. Rate-Limiting Nutrient:

Algal assay results show that Lake Eau Claire was nitrogen limited at the time the assay sample was collected. The lake data indicate nitrogen limitation in June as well, but the August data indicate a borderline phosphorus limitation.

C. Nutrient Controllability:

1. Point sources--During the sampling year, Lake Eau Claire received a total phosphorus load at a rate over five times that proposed as "dangerous" by Vollenweider (in press) i.e., a eutrophic rate (see page 15). Of this load, the sewered communities in the drainage are estimated to have contributed only about 13%. Even with 100% phosphorus removal at the point sources, the lake would still receive a phosphorus load of about 70 lbs/acre/yr or 7.8 $g/m^2/yr$. Therefore, it is concluded that phosphorus removal at the communities in the drainage would not appreciably improve the trophic conditon of Lake Eau Claire.

2. Non-point sources (see page 15)--The phosphorus export of the Muskrat Creek during the sampling year was similar to that of other unimpacted Wisconsin streams studied. However, the exports of the Eau Claire River and Hay Creek were appreciably higher and indicate underestimation of the point-source loads to those streams.

II. INTRODUCTION

Lake Eau Claire was formed in 1937 by impoundment of the Eau Claire River in the lower Chippewa River drainage in west central Wisconsin. It is the largest water body in Eau Claire County. Water levels are controlled by a 25-foot-head dam owned by Eau Claire County. The entire shoreline of the lake is also owned by the County which leases building rights to individuals. Much of the lake drainage is in the Eau Claire County Forest.

Recreational uses of the lake include swimming, boating, and fishing. Game fish present include muskellunge, walleyes, large- and smallmouth bass, and panfish; carp are said to be a management problem (Sather and Threinen, 1964).

Public access is good, and commercial facilities include three boat rentals and a resort.

III. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry*:

1. Surface area: 1,118 acres.
2. Mean depth: 7.4 feet.
3. Maximum depth: 25 feet.
4. Volume: 8,307 acre/feet.
5. Mean hydraulic retention time: 10 days.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area†	Mean flow†
Eau Claire River	506.0 mi^2	373.6 cfs
Hay Creek	39.9 mi^2	26.8 cfs
Muskrat Creek	29.5 mi^2	20.8 cfs
Minor tributaries & immediate drainage -	17.8 mi^2	13.8 cfs
Totals	593.2 mi^2	434.9 cfs

2. Outlet -

Eau Claire River	595.0 mi^{2}††	434.9 cfs††

C. Precipitation†††:

1. Year of sampling: 46.4 inches.
2. Mean annual: 31.0 inches.

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* Dept. of Natural Resources lake survey map (1960).
† Drainage areas are accurate within ±0.5%; mean daily flows are accurate within ±40%; mean monthly flows are accurate within ±35%; and normalized monthly flows are accurate within ±35%.
†† Includes area of lake; outflow adjusted to equal sum of inflows.
††† See Working Paper No. 1; "Survey Methods".

IV. LAKE WATER QUALITY SUMMARY

Lake Eau Claire was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from five stations on the lake and from a number of depths at each station (see map, page vi); near-surface samples were collected once at stations 6 and 7. During each visit, a single depth-integrated (15 feet or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the last visit, two separate five-gallon depth-integrated samples were composited from stations 1, 3, and 4 for one assay and from stations 2 and 5 for the other. The maximum depths sampled were 18 feet at station 1, 7 feet at station 2, 17 feet at stations 3 and 4, and 9 feet at station 5.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake was essentially well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (11/05/72)		
Temperature (Cent.)	4.2	4.6	4.6	4.7
Dissolved oxygen (mg/l)	9.6	10.2	10.4	10.6
Conductivity (μmhos)	72	79	80	82
pH (units)	6.5	6.9	7.0	7.1
Alkalinity (mg/l)	12	14	14	16
Total P (mg/l)	0.097	0.116	0.118	0.134
Dissolved P (mg/l)	0.053	0.061	0.061	0.068
NO_2 + NO_3 (mg/l)	0.310	0.369	0.380	0.420
Ammonia (mg/l)	0.100	0.140	0.140	0.160
		ALL VALUES		
Secchi disc (inches)	16	30	32	60

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
06/27/72	1. Anabaena	3,891
	2. Dinobryon	3,213
	3. Melosira	679
	4. Cyclotella	317
	5. Fragilaria	226
	Other genera	1,312
	Total	9,638
08/27/72	1. Melosira	795
	2. Chlamydomonas	602
	3. Cyclotella	265
	4. Anabaena	181
	5. Navicula	181
	Other genera	687
	Total	2,711
11/05/72	1. Scenedesmus	1,224
	2. Pediastrum	829
	3. Flagellates	753
	4. Dinobryon	621
	5. Anabaena	264
	Other genera	885
	Total	4,576

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
06/26/72	01	5.4
	02	28.8
	03	10.7
	04	5.0
	05	71.5
	06	53.2
	07	118.6
08/27/72	01	1.9
	02	9.0
	03	2.5
	04	2.4
	05	5.3
11/05/72	01	1.3
	02	1.4
	03	1.4
	04	13.5
	05	1.5

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. Stations 1, 3, and 4 -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.058	0.430	7.8
0.006 P	0.064	0.430	7.5
0.012 P	0.070	0.430	7.9
0.024 P	0.082	0.430	7.8
0.060 P	0.118	0.430	7.9
0.060 P + 10.0 N	0.118	10.430	47.2
10.0 N	0.058	10.430	14.9

b. Stations 2 and 5 -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.042	0.319	7.2
0.006 P	0.048	0.319	7.2
0.012 P	0.054	0.319	7.1
0.024 P	0.066	0.319	7.2
0.060 P	0.102	0.319	7.9
0.060 P + 10.0 N	0.102	10.319	44.6
10.0 N	0.042	10.319	15.6

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Lake Eau Claire was high at the time of sampling. The assays also indicate nitrogen limitation. Note the lack of a significant increase in yields with the additions of orthophosphate, but with the addition of nitrogen the increases in yields were significant. The lake data also indicate nitrogen limitation at the time of sampling (nitrogen to phosphorus ratios were 8 to 1, and nitrogen limitation would be expected).

The lake data indicate nitrogen limitation in June (mean N/P ratio of 11/1) but a borderline phosphorus limitation in August (mean N/P ratio of 14/1).

D. Trophic Condition:

Survey data and the records of others show that Lake Eau Claire is eutrophic. Survey limnologists noted abundant growths

of rooted aquatic vegetation in bays and along the shoreline, and Wisconsin records show that periodic chemical treatments to control algae have been undertaken (Lueschow, 1972).

Of the 46 Wisconsin lakes studied, 31 had less mean total phosphorus, 29 had less mean dissolved phosphorus, 34 had less mean inorganic nitrogen, 34 had greater Secchi disc transparencies, and 30 had less mean chlorophyll a.

Marked depression of dissolved oxygen with depth was noted at four of the five sampling stations in June, 1972.

V. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the Wisconsin National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vii), except for the high runoff months of March and May when two samples were collected at most stations. Sampling was begun in September, 1972, and was completed in August, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Wisconsin District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, tributary nutrient loads were determined by using a modification of a U.S. Geological Survey computor program for calculating stream loadings*. Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the pounds per square mile per year calculated for Muskrat Creek at station C-1 and multiplying that by the ZZ area in square miles.

The wastewater treatment plants of the City of Thorp and the villages of Stanley, Boyd, and Fairchild were not sampled during the Survey. The loads attributed to these sources were estimated at 2.5 lbs P and 7.5 lbs N/capita/year.

In the following loading tables, the nutrient loads attributed to the various tributaries do not include the estimated point-source loads.

---

* See Working Paper No. 1.

A. Waste Sources:

1. Known municipal -

Name	Pop.* Served	Treatment	Mean** Flow (mgd)	Receiving Water
Thorp	1,465	Trickling filter	1.200	N. Fork, Eau Claire River
Stanley	2,055	Act. sludge	0.230	Wolf River
Boyd	578	Trickling filter	0.030	Hay Creek
Fairchild	557	Ponds	0.025	Black Creek

2. Industrial** -

There are six cheese plants and one dairy with individual waste disposal facilities in the Lake Eau Claire drainage. Wisconsin records indicate satisfactory land disposal at most of these sources.

* 1970 Census.
** McKersie, et al., 1971.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Eau Claire River	68,490	76.0
Hay Creek	5,500	6.1
Muskrat Creek	2,670	3.0
b. Minor tributaries & immediate drainage (non-point load) -	1,620	1.8
c. Known municipal STP's -		
Boyd	1,440	1.6
Stanley	5,140	5.7
Thorp	3,660	4.1
Fairchild	1,390	1.5
d. Septic tanks* -	70	<0.1
e. Industrial - Unknown	?	-
f. Direct precipitation** -	170	0.2
Total	90,150	100.0

2. Outputs -

Lake outlet - Eau Claire River 92,080

3. Net annual P loss - 1,930 pounds

* Estimated 90 dwellings, 1 resort, and 1 park on shoreline; see Working Paper No. 1.
** Estimated; see Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Eau Claire River	965,610	80.9
Hay Creek	73,930	6.2
Muskrat Creek	65,810	5.5
b. Minor tributaries & immediate drainage (non-point load) -	39,710	3.3
c. Known municipal STP's -		
Boyd	4,340	0.4
Stanley	15,410	1.3
Thorp	10,990	0.9
Fairchild	4,180	0.4
d. Septic tanks* -	2,430	0.2
e. Industrial - Unknown	?	-
f. Direct precipitation** -	10,770	0.9
Total	1,193,180	100.0

2. Outputs -

Lake outlet - Eau Claire River 1,128,730

3. Net annual N accumulation - 64,430 pounds

* Estimated 90 dwellings, 1 resort, 1 park on shoreline; see Working Paper No. 1.
** Estimated; see Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs $P/mi^2/yr$	lbs $N/mi^2/yr$
Eau Claire River	135	1,908
Hay Creek	138	1,853
Muskrat Creek	91	2,231

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	80.6	loss*	1,067.2	57.6
grams/m^2/yr	9.04	-	119.6	6.5

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lake Eau Claire:

"Dangerous" (eutrophic rate)	1.76
"Permissible" (oligotrophic rate)	0.88

* Even though Lake Eau Claire has a short hydraulic retention time, loss of phosphorus would not be expected, particularly in view of the indicated nitrogen accumulation. The apparent loss probably was due to insufficient sampling.

VI. LITERATURE REVIEWED

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TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5515 LAKE EAU CLAIRE

TOTAL DRAINAGE AREA OF LAKE 595.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
5515A1	595.00	88.00	100.00	820.00	1300.00	680.00	710.00	250.00	260.00	230.00	220.00	310.00	160.00	427.72
5515A2	506.00	64.00	76.00	700.00	1200.00	590.00	630.00	220.00	220.00	200.00	190.00	270.00	120.00	373.57
5515B1	39.90	3.50	3.50	44.00	140.00	34.00	31.00	12.00	9.00	11.00	11.00	17.00	6.20	26.79
5515C1	29.50	2.40	2.40	32.00	120.00	24.00	22.00	8.20	6.20	7.60	7.70	13.00	4.30	20.75
5515ZZ	19.60	1.50	1.50	20.00	86.00	15.00	13.00	5.00	3.80	4.70	4.80	8.00	2.70	13.78

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 595.00
SUM OF SUB-DRAINAGE AREAS = 595.00

TOTAL FLOW IN = 5217.98
TOTAL FLOW OUT = 5128.00

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5515A1	9	72	1100.00	23	840.00				
	10	72	1100.00	15	610.00				
	11	72	1100.00						
	12	72	200.00	9	260.00				
	1	73	400.00	21	480.00				
	2	73	160.00	10	160.00				
	3	73	3100.00	10	3300.00	31	1100.00		
	4	73	1300.00	14	580.00				
	5	73	2600.00	2	8800.00	30	1100.00		
	6	73	370.00	17	220.00				
	7	73	94.00	18	75.00				
	8	73	100.00	12	100.00				
5515A2	9	72	1000.00	23	740.00				
	10	72	890.00	15	510.00				
	11	72	920.00						
	12	72	170.00	9	210.00				
	1	73	340.00	21	400.00				
	2	73	130.00	10	130.00				
	3	73	2600.00	10	2800.00	31	980.00		
	4	73	1100.00	14	500.00				
	5	73	2300.00	2	7600.00	30	960.00		
	6	73	310.00	17	190.00				
	7	73	77.00	18	62.00				
	8	73	86.00	12	86.00				

TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5515 LAKE EAU CLAIRE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
551581	9	72	140.00	23	100.00				
	10	72	58.00	15	34.00				
	11	72	60.00						
	12	72	8.10	9	10.00				
	1	73	16.00	21	20.00				
	2	73	6.40	10	6.20				
	3	73	170.00	10	180.00	31	63.00		
	4	73	130.00	14	58.00				
	5	73	260.00	2	900.00	30	110.00		
	6	73	15.00	17	9.00				
	7	73	3.80	18	2.90				
	8	73	4.10	12	4.10				
5515C1	9	72	110.00	23	84.00				
	10	72	42.00	15	25.00				
	11	72	43.00						
	12	72	5.60	9	7.20				
	1	73	11.00	21	14.00				
	2	73	4.40	10	4.20				
	3	73	120.00	10	130.00	31	45.00		
	4	73	98.00	14	44.00				
	5	73	210.00	2	690.00	30	86.00		
	6	73	11.00	17	6.30				
	7	73	2.60	18	2.00				
	8	73	2.90	12	2.90				
5515ZZ	9	72	83.00	23	62.00				
	10	72	27.00	15	16.00				
	11	72	28.00						
	12	72	3.50	9	4.40				
	1	73	6.80	21	8.20				
	2	73	2.60	10	2.60				
	3	73	78.00	10	81.00	31	29.00		
	4	73	69.00	14	31.00				
	5	73	150.00	2	480.00	30	61.00		
	6	73	6.60	17	3.90				
	7	73	1.60	18	1.30				
	8	73	1.80	12	1.80				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/09/30

551501
44 45 42.0 091 07 48.0
EAU CLAIRE LAKE
55 WISCONSIN

11EPALES
3

2111202
0020 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/26	14	55 0000	23.2	16.4	30	90	9.40	24	0.060	0.080	0.069	0.031
	14	55 0005	21.0	13.6								
	14	55 0010	19.0	4.8								
	14	55 0015	18.9	2.2		90	7.30	30	0.090	0.570	0.080	0.047
	14	55 0018	18.9	1.4		110	7.00	33	0.100	0.810	0.092	0.046
72/08/27	16	18 0000				85	6.90	31	0.100	0.440	0.074	0.040
	16	18 0004	20.6	5.6		81	6.90	31	0.080	0.420	0.088	0.035
	16	18 0011	20.1	5.7		83	6.80	32	0.090	0.450	0.104	0.037
72/11/05	11	35 0000			16	80	7.00	15	0.390	0.140	0.125	0.061
	11	35 0004	4.6	9.6		80	7.00	14	0.390	0.140	0.118	0.060
	11	35 0012	4.6	9.6		78	7.00	14	0.380	0.140	0.118	0.062
	11	35 0017	4.6	9.6		78	7.00	14	0.340	0.150	0.115	0.064

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/26	14	55 0000	5.4J
72/08/27	16	18 0000	1.9J
72/11/05	11	35 0000	1.3J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

551502
44 45 48.0 091 05 48.0
LAKE EAU CLAIRE
55 WISCONSIN

11EPALES 2111202
3 0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/26	15 20	0000	22.5	12.9	30	85	9.00	25	0.070	0.100	0.054	0.030
	15 20	0005	20.0	8.4								
	15 20	0007	19.0	6.2		85	7.50	26	0.070	0.260	0.085	0.038
72/08/27	16 42	0000			33	75	7.00	29	0.140	0.240	0.078	0.031
	16 42	0004	21.0	8.1		72	7.00	29	0.150	0.340	0.086	0.038
72/11/05	12 45	0000			17	80	7.00	16	0.320	0.160	0.101	0.058
	12 45	0004	4.2	10.6		80	7.10	14	0.330	0.150	0.105	0.058

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/26	15 20	0000	22.8J
72/08/27	16 42	0000	9.0J
72/11/05	12 45	0000	1.4J

J VALUE KNOWN TO BE IN ERROR

12

STORET RETRIEVAL DATE 74/09/30

551503
44 45 30.0 091 07 42.0
EAU CLAIRE LAKE
55 WISCONSIN

11EPALES 2111202
3 0019 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/27	13 35	0000	22.0	11.3	42	85	7.30	26	0.040	0.150	0.048	0.024
	13 35	0007	19.5	6.2		87	7.20	29	0.060	0.330	0.065	0.033
	13 35	0017	18.0	0.2		105	6.95	33	0.090	1.200	0.163	0.077
72/08/27	16 30	0000			33	83	7.00	33	0.100	0.390	0.089	0.039
	16 30	0004	21.6	6.8		80	7.00	32	0.080	0.370	0.090	0.036
	16 30	0015	19.7	7.0		80	6.80	32	0.090	0.420	0.090	0.038
72/11/05	12 15	0000			16	80	7.00	15	0.410	0.150	0.126	0.064
	12 15	0004	4.6	10.4		80	7.10	14	0.420	0.150	0.129	0.067
	12 15	0015	4.6	10.4		80	7.10	14	0.420	0.140	0.134	0.068

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/27	13 35	0000	10.7J
72/08/27	16 30	0000	2.5J
72/11/05	12 15	0000	1.4J

J VALUE KNOWN TO BE WITHIN ERROR

STORET RETRIEVAL DATE 74/09/30

551504
44 45 36.0 091 08 12.0
EAU CLAIRE LAKE
55 WISCONSIN

11EPALES 2111202
3 0019 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/27	14	15 0000	20.6	4.6	60	87	7.16	30	0.040	0.360	0.055	0.038
	14	15 0005	19.1	2.3		90	7.00	29	0.040	0.260	0.048	0.028
	14	15 0017	18.3	0.3		100	6.85	35	0.030	0.610	0.058	0.032
72/08/27	16	05 0000			33	85	6.90	31	0.090	0.450	0.070	0.033
	16	05 0004	20.9	5.7		85	6.90	31	0.080	0.440	0.038	0.033
	16	05 0015	20.2	5.5		87	6.90	32	0.080	0.530	0.101	0.042
72/11/05	11	55 0000			18	80	6.90	14	0.380	0.140	0.126	0.065
	11	55 0004	4.6	10.4		80	7.00	12	0.380	0.120	0.119	0.062
	11	55 0014	4.6	10.4		82	6.90	12	0.380	0.140	0.118	0.060
	11	55 0018	4.6	10.4		80	7.00	13	0.380	0.130	0.115	0.062

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/27	14	15 0000	5.0J
72/08/27	16	05 0000	2.4J
72/11/05	11	55 0000	13.5J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

551505
44 45 48.0 091 06 54.0
EAU CLAIRE LAKE
55 WISCONSIN

11EPALES 2111202
3 0012 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/27	15 00	0000	24.8	14.4	30	100	9.63	20	0.050	0.060	0.074	0.035
	15 00	0009	22.3	11.4		87	9.22	29	0.050	0.080	0.071	0.036
72/08/27	16 55	0000			33	90	7.00	34	0.100	0.440	0.079	0.035
	16 55	0004	21.8	6.4		90	6.90	33	0.090	0.410	0.083	0.038
	16 55	0009	21.4	6.4		80	7.00	32	0.080	0.380	0.087	0.035
72/11/05	12 30	0000			17	80	6.50	14	0.340	0.150	0.097	0.053
	12 30	0004	4.7	10.6		75	6.70	14	0.340	0.140	0.104	0.054
	12 30	0008	4.7	10.6		72	6.70	13	0.310	0.100	0.102	0.054

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/27	15 00	0000	71.5J
72/08/27	16 55	0000	5.3J
72/11/05	12 30	0000	1.5J

J VALUE KNOWN TO BE IN ERROR

24

STORET RETRIEVAL DATE 74/09/30

551506
44 46 00.0 091 05 24.0
EAU CLAIRE LAKE
55 WISCONSIN

11EPALES
3

2111202
0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/27	15 30	0000	25.3	12.1	36	87	9.28	22	0.020	0.030	0.062	0.024

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/27	15 30	0000	53.2J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

551507
44 45 42.0 091 05 24.0
EAU CLAIRE LAKE
55 WISCONSIN

11EPALES 2111202
3 0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/27	15 45	0000	24.6	10.0	36	85	8.33	21	0.060	0.070	0.060	0.027

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/27	15 45	0000	118.6J

J VALUE KNOWN TO BE LESS THAN

APPENDIX C

TRIBUTARY DATA

STORET RETRIEVAL DATE 74/10/02

551541 L5551541
44 45 00.0 091 0M 30.0
EAU CLAIRE RIVER
55 15 CADOTT
O/LAKE EAU CLAIRE
ST HWY 27 BRDG 5 MI N OF AUGUSTA
11EPALES 2111204
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	11 30		0.146	1.170	0.135	0.023	0.100
72/10/15			0.195	1.050	0.160	0.027	0.100
72/11/11			0.220	1.412	0.063	0.037	0.095
72/12/09			0.280	0.540	0.054	0.029	0.060
73/01/21	09 45		0.390	0.455	0.132	0.039	0.065
73/02/10			0.410	0.830	0.140	0.046	0.075
73/03/10	10 45		0.410	2.900	0.790	0.132	0.250
73/03/31	10 00		0.198	0.600	0.013	0.022	0.050
73/04/14			0.100	1.200	0.044	0.022	0.045
73/05/02	12 30		0.105	1.300	0.120	0.029	0.290
73/05/30	13 00		0.075	1.000	0.012	0.027	0.055
73/06/17	10 00		0.013	0.980	0.029		0.110
73/07/18	17 00		0.017	0.460	0.044	0.013	0.040
73/08/12			0.400	0.860	0.072	0.067	0.140

STORET RETRIEVAL DATE 74/10/02

5515A2 L5551542
44 45 00.0 091 03 30.0
EAU CLAIRE RIVER
55 15 OSSEO
I/LAKE EAU CLAIRE
CO HWY G BRDG NE OF AUGUSTA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	11	15	0.275	1.600	0.172	0.075	0.190
72/10/15			0.210	1.500	0.110	0.028	0.078
72/11/11			0.176	1.050	0.060	0.033	0.069
73/01/21	10	20	0.490	1.260	0.252	0.060	0.115
73/02/10			0.410	0.680	0.132	0.058	0.075
73/03/10	11	15	0.357	1.600	0.420	0.105	0.200
73/03/31	10	30	0.160	1.320	0.025	0.026	0.045
73/04/14			0.097	1.100	0.063	0.014	0.040
73/05/02	13	00	0.220	1.230	0.088	0.058	0.195
73/05/30	10	45	0.016	1.000	0.030	0.018	0.045
73/06/17	11	00	0.048	1.100	0.046	0.015	0.145
73/07/18	17	30	0.010K	0.400	0.019	0.011	0.040
73/08/12			0.390	0.630	0.039	0.063	0.115

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

5515R1 L5551581
44 47 00.0 091 05 30.0
HAY CREEK
55 15 CADOTT
T/LAKE EAU CLAIRE
CO HWY NN XING UPSTREAM OF LAKE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	12 15		0.142	1.350	0.170	0.054	0.138
72/10/15			0.117	0.900	0.075	0.032	0.072
72/11/11			0.270	0.840	0.033	0.042	0.075
72/12/09					0.210	0.100	0.190
73/01/21	11 15		0.620	1.400	0.379	0.068	0.135
73/02/10			0.880	0.500	0.105	0.056	0.085
73/03/10	12 00		0.400	1.900	0.590	0.138	0.230
73/03/31	12 30		0.480	0.880	0.032	0.099	0.150
73/05/02			0.230	2.300	0.115	0.060	0.135
73/05/30	12 00		0.052	1.050	0.034	0.058	0.105
73/06/17	14 00		0.200	1.260	0.016	0.005K	0.210
73/07/19	18 15		0.065	0.440	0.029	0.059	0.103
73/09/12			0.420	1.150	0.149	0.063	0.113

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

551582 LS551582
44 55 00.0 091 02 00.0
HAY CREEK
55 15 CADOTT
T/LAKE EAU CLAIRE
CO HWY D XING BELO HOYD STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	12	30	0.247	1.150	0.157	0.110	0.250
72/10/15			0.720	1.050	0.081	0.069	0.154
72/11/11			0.780	1.600	0.120	0.126	0.180
72/12/09			0.750	0.540	0.110	0.035	0.060
73/01/21	12	15	1.300	3.200	1.020	0.300	0.430
73/03/10	12	30	0.650	2.800	0.920	0.260	0.375
73/03/31	12	45	0.115	0.520	0.019	0.038	0.060
73/04/14			0.580	6.000	0.270	0.168	0.510
73/05/30	12	30	0.052	0.790	0.016	0.063	0.100
73/06/17	12	15	0.073	1.800	0.050		0.520
73/07/18	18	30	0.060	0.690	0.058	0.147	0.220

STORET RETRIEVAL DATE 74/10/02

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 5515C1          L5515C1
44 47 30.0 091 03 30.0
MUSKRAT CREEK
55      15 CADOTT
T/LAKE EAU CLAIRE
CO HWY NN XING W OF GRANDVIEW SCHOOL
11PALES                  2111204
"                        0000 FEET  DEPTH
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DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	11 55		0.010K	1.100	0.005K	0.029	0.069
72/10/15			0.087	0.750	0.110	0.016	0.050
72/12/09			0.120	1.150	0.138	0.023	0.052
73/01/21	10 45		0.370	1.680	0.220	0.039	0.092
73/02/10			0.270	0.720	0.160	0.029	0.054
73/03/10	11 45		0.170	1.050	0.168	0.036	0.065
73/03/31	11 30		0.038	1.470	0.231	0.015	0.035
73/05/02	14 00		0.060	2.600	0.168	0.020	0.055
73/05/30	12 45		0.016	1.050	0.034	0.021	0.045
73/06/17	13 30		0.260	1.200	0.054		0.125
73/07/18	18 00		0.015	0.680	0.025	0.022	0.050
73/08/12			0.430	4.500	0.230	0.065	0.125

K VALUE KNOWN TO BE LESS THAN INDICATED